Composable Mission Space Environments 101

Composable
Mission
Space
Environments

Phil Zimmerman

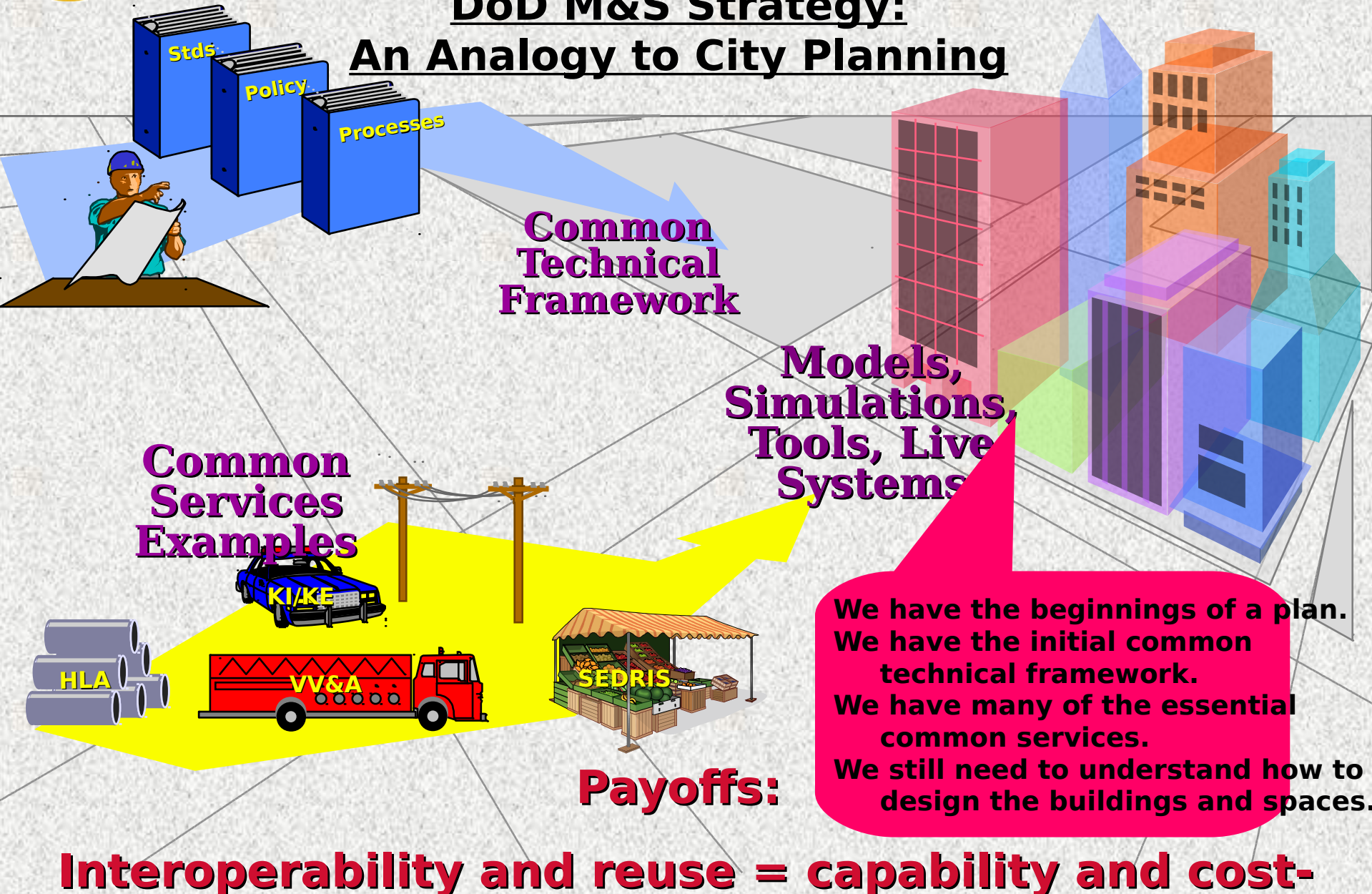Chris Turrell

Jim Heusmann

Vic Dirienzo

"As long as all things are created from scratch, growth can at most be linear"

M&S: What Do We Have Now?

DoD M&S Strategy:
An Analogy to City Planning

Stds

Policy

Processes

Common Technical Framework

Models, Simulations, Tools, Live Systems

Common Services Examples

KI/KE

HLA

VV&A

SEDRIS

We have the beginnings of a plan.
We have the initial common technical framework.
We have many of the essential common services.
We still need to understand how to design the buildings and spaces.

Payoffs:

Interoperability and reuse = capability and cost-

Initial capability: commonality → **Product evolution creates user div**

Different classes of experienced users

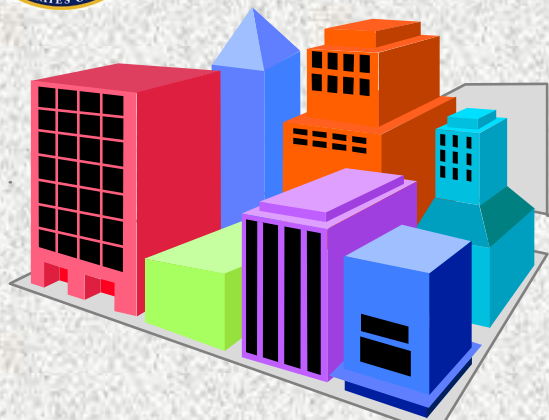**Some game commonality across products**   **Interchangeable parts**   **Social dimension**

Today's Kids (tomorrow's warfighters) will expect
ar rapidly composable, transparent capabilities in their warfighting syst

Where Do We Need to Go?

From Buildings
To
Building Blocks

AND AT THE SAME TIME

From Childhood
Reality
To
Warfighter Reality

And Just How are WE Supposed to Do ALL That?

- **CMSE**
  - Take the best of what's available in:
    - M&S
    - Related disciplines
  - Build only what is necessary
  - Marry theory with current practice
  - When possible, develop broad solutions to specific needs
  - Support composability with applicable policy
  - BE DOMAIN INDEPENDENT

Composable Mission Space Environments

Facilitate M&S composability through:

- **Industry, DoD, National, International Stds**
- **Best practices**
- **Community consensus**

Use current service M&S efforts as testbeds to determine applicability of current M&S technologies, ways to improve them, and areas where M&S technology needs to be fostered

Some pieces already exist:
- **HLA**
- **SEDRIS**
- **FDMS**
- **MSRR**

Building Mission Space Environments Through Development of:

Policies

By Participating in Service Efforts to Determine:

Requirements

And Still Satisfy the M&S Community's Desire For:

Reusability

Theory   Practice

Responsiveness

Interoperability

Look to Services for applicability, missing and modifiable components

Uses

Implementations

Goal: Flexibility and Rapid Composability

Technologies

Processes

Use the best of what is available; build only what is needed

Partner with related efforts to provide common tools and services for THEIR M&S domain application:
- **Joint Synthetic Battlespace**
- **Joint Virtual Battlespace**
- **JFCOM Continuous Experimentation Environment**
- **Etc.**

Allow Services and commands to do what they do best, and concentrate on hiding the seams when the different mission space environments are brought together

CMSE at a Glance

Program Objectives

1. Determine common needs and applicable technologies for creating flexible synthetic battlespaces for CMSE from warfighter requirements
2. Determine state of the art in software and hardware composability, and if principles from other disciplines can be applied to composing modular battlespaces from basic components.
3. Provide missing tools and procedures to assure fitness for use of CMSE components
4. Establish relationships without establishing dependencies (will allow for provision of near term successes – for JSB, JVB, etc.)
5. Establish/use commercial standards

How do we know this is the right thing to do?

- Multi-resolution and composable simulation environments

- Link to C4I systems (with reach back)

- Faster, less costly database development

- Standardized (reusable) components

- Reduced Overhead

Warfighter M&S Needs Assessment of the Unified Commands and Selected Supporting Commands
Final Report -17

CMSE: Determining Direction

- **Where do we start?**
  - CMSE Thread: Formal Specification
- **What is currently important to the Services and Commands?**
  - CMSE Thread: Experimental Environments
- **How do we enable the collaboration within a mission space development?**
  - CMSE Thread: Advanced Distributed Collaborative Environments
- **What is missing from the CMSE tool package?**
  - Underlying Technical Challenges
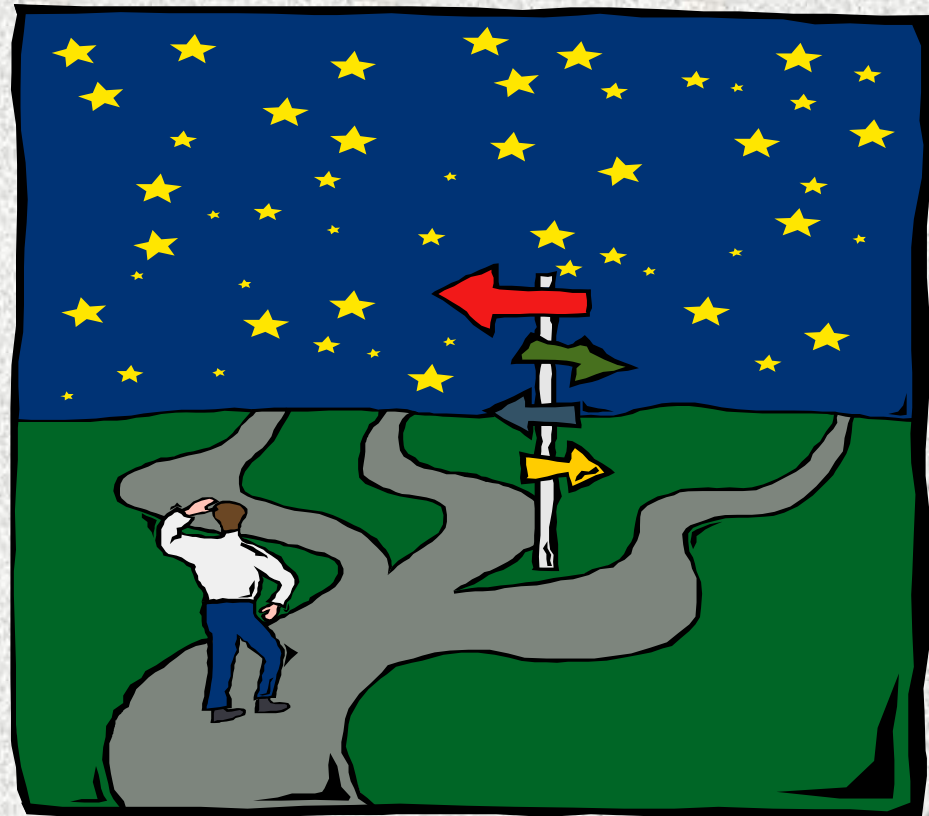
REMEMBER: CMSE is NOT an end in itself – it is an interrelated collection of enabling M&S technologies, tools, and procedures...

CMSE Component Objectives

- Insight on the hypothesis that composability will make reuse, assembling, creating, selecting, recombining, and managing simulations easier

- Define & bound the problem – establish legitimacy through formal definitions, developed standards and formalisms

- Establish feasibility and identify implementation issues, technology leverage

- Use the Services as willing victims by inserting component technologies into existing battlespace efforts

- Systematically build CMSE capabilities using short term needs to keep the community interest, and allow real-time valid course correction

- Demonstrate near-term successes; but with components that are viable in the future

Formal Specification

Experimental Environments

Underlying Technical Challenges

Distributed Collaborative Environments

- Develop a standard for the coding of "self-describing simulation components/modules"

- Add the ability to utilize integrated component contracts for verifying composition integrity

- Enable the coupling and integration of

- Ensure CEE components and M&S components are easily integratable

- Develop CEE standards that enable real-time project collaboration in a distributed environment

- Evaluate use of SW agent to embed application into the CEE to run applications that are not available to

CMSE FY03 Program

- Initiate independent study of CMSE to identify, bound and bin the problem

- Conduct workshops on current state of the art of composability, to gain community consensus on definitions and applicable technologies

- Develop formalisms which address critical aspects of composability, in order to build higher order tools on them (leverage ONR investment)

Formal Specification

- Design and initiate development of a functional decomposition and specification of composable M&S environments

- Demonstrate a before and after look at a modified component framework illustrating the use and benefit of automated composability from contracts

Underlying Technical Challenges

Experimental Environments

- Build common products to satisfy immediate needs in current M&S "synthetic battlespace" efforts

- Complete work on current "common" components (e.g. IEEE 1516 acceptance, Sim-ADL formal process for linkage)

Distributed Collaborative Environments

- Establish a first look at using CEE to enable lifecycle reuse of M&S tools and data

- Develop CEE standards that enable real-time project collaboration in a distributed environment, to include cost and process modeling, and scheduling

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QUESTIONS?

"As long as all things are created from scratch, growth can at most be linear"